

THE WESTERN AUSTRALIAN NATURALIST

Vol. 5

MAY 29, 1956

No. 4

OBSERVATIONS ON THE BURROW AND NATURAL HISTORY OF THE TRAP-DOOR SPIDER *Missulena* (*Ctenizidae*)

by BARBARA YORK MAIN, Zoology Department,
University of Western Australia.

INTRODUCTION

The genus *Missulena* is wide-spread over the Australian continent and specimens are frequently sent to museums. Mature male specimens have the unusual habit, for trap-door spiders, of wandering in search of mates during day-light. This behaviour, added to the brilliant colour of some species, makes them very conspicuous even to the non-naturalist. In addition to the colourful males numerous female specimens are also forwarded to museums. The females never vacate the burrows and can therefore be obtained only by disturbing the soil in which the burrow is situated. Yet the literature contains almost no authoritative records of the natural history of these spiders. The chief purpose of the present paper is thus to place on record what biological observations the author has made on the genus, with particular reference to one species, which has been identified as *Missulena insignis* (O. P. Cambridge, 1877), according to Womersley's description (Womersley, 1943, p. 257-8).

Taxonomic note:

The taxonomy of *Missulena* was very confusing until Womersley (1943) revised the genus, and reduced the number of species to six. Much of the earlier confusion was due to species having been named from only one sex and there followed the problem of associating the females with the appropriate males. In spite of Womersley's consolidation there is still difficulty in naming some specimens. The author has collected many specimens of *Missulena* and is of the opinion that the genus is in need of further taxonomic revision but this requires more work before a complete account can be presented.

NATURAL HISTORY

Burrow structure:

Rainbow and Pulleine (1918, p. 82) report the burrow of *Missulena occatoria* to have a "wafer" door without any admixture of soil particles. Loaring and Loaring (1948, p. 132) made the observation that two burrows of *M. hoggi* had a door like a "flimsy silken

flap." However, McKeown (1952, pp. 211-2) says of *M. occatoria*: "The burrow of the female is a long subterranean tunnel which is sometimes excavated to a depth of three or four feet or more; . . . The mine is simply walled with bare earth, and has no pretensions to tapestry hangings or door."

From the author's observations the above reports are shown to be either incomplete, or, as in the last example, fallacious. The burrows of all the *Missulena* specimens collected, when not damaged during excavation, were found to have an entrance with 2 doors. Those of *M. insignis* were heavy structures, the silk reinforced with soil so that they were quite thick and had bevelled margins. Such doors were always roughly oval in outline. In another species of *Missulena* the doors were observed to be much thinner and more fragile and indeed each was like a "flimsy silken flap." Burrows of mature specimens contained, several inches below the surface, a horizontal side-shaft about 1.5 inches long, which could be closed from the main shaft by a vertically hinged door. The upper part of the burrow is always oval or elliptical in section, which shape is associated with the broad squat body of the spiders. Below the sideshaft the burrow is always circular in section. The lining of the burrow is a vertical adpressed tube which extends slightly, horizontally, onto the surface and there collapses. The upper and lower flaps of the extended tube are attached in the mid-region at the edge; thus the two so-formed lateral pieces of the upper flap function as two doors, whilst the bisected lower flap forms a double lip to the entrance of the burrow. This lip usually has several attached silk strands radiating out for about an inch which serve to secure it firmly to the



Fig. 1.—The entrance of a burrow of *Missulena insignis* (O. P. Cambridge), with the doors closed. Approximately $\times 1\frac{2}{5}$.

—Photo by V. N. Serventy



Fig. 2.—The same burrow as in Fig. 1, with the doors propped open. Approximately $\times 1 \frac{2}{5}$.

—Photo by V. N. Serventy

ground. The side-shaft door is a thin, wafer-like structure, constructed chiefly of silk with a little soil incorporated. The side which faces into the side-shaft is usually neatly covered with silk, but the outer side, facing into the main shaft is often of a rough texture, consisting mainly of soil. The species mentioned above as having wafer doors at the entrance of the main shaft has a thick, cork-like door to the side-shaft. In some burrows of very large old specimens there is evidence of old derelict side-shafts with webbed over doors, with, at a lower level, a currently functioning side-shaft. Juvenile burrows do not seem to have a side-shaft. Burrows of large specimens may reach a depth of 10 or 12 inches, with a diameter of at least 1.5 inches in the lower part and about 1 inch in the upper part (where it is oval in section). The side-shaft of large specimens is usually about 1.5 inches in extent.

The burrows of *M. insignis* have a continuous, parchment-like, silk lining to the burrow and it is often possible, by dissecting the burrow cavity from one side, to lift out the lining in one piece with entrance doors and entire side-shaft attached. Of the 21 specimens of *M. insignis* collected from the burrows there was only one anomalous case, of a specimen having the door structure characteristics of a different species!

The entrance of a burrow of *M. insignis* is shown in Figures 1 and 2. These photographs were taken in the bush south of Walebing. The characteristic structure of a burrow is shown diagrammatically in section in Figure 3A.

Four specimens of *Missulena* with a peculiar modification of the side-shaft door were collected at Juranda in December, 1953. These specimens all had shallow burrows not exceeding 6 inches

in depth and with the side-shaft just below the surface. The entrances were not observed due to the burrows having been exposed by slicing the litter-covered soil with a spade. The doors of the side-shafts were thick and pebble-like. They were made of soil and shaped roughly like a pear cut longitudinally in half. The flattened side was covered with silk and faced into the side-shaft when closed. The rounded side had very little silk incorporated in

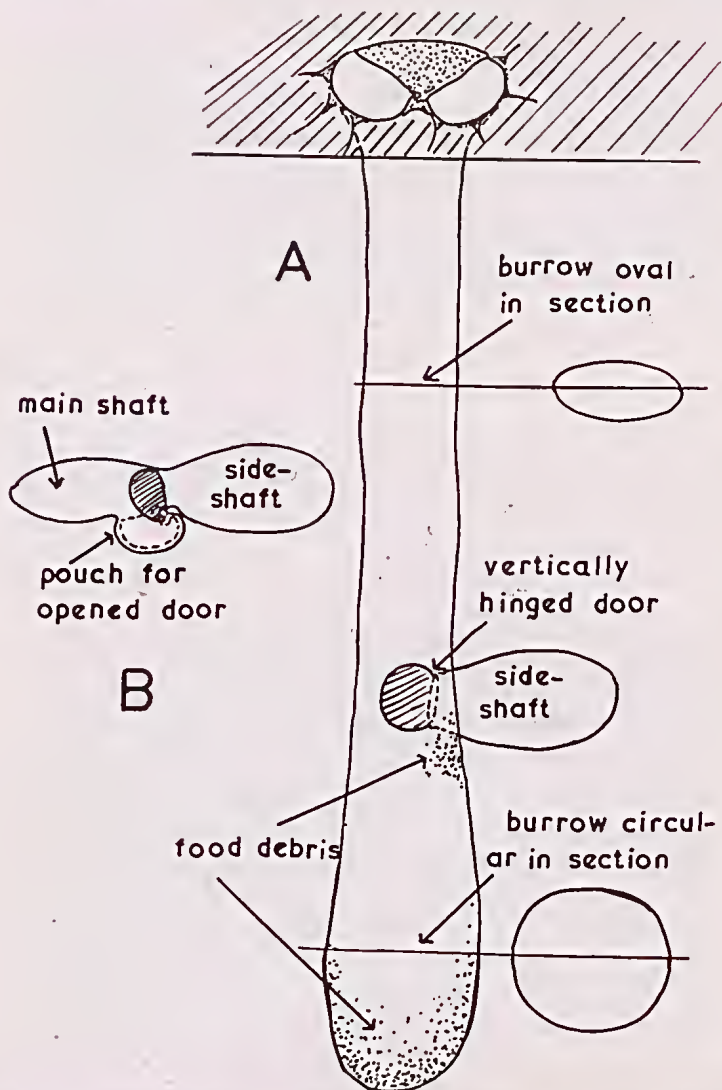


Fig. 3. A, Diagrammatic outline of a section of a typical burrow of *Missulena insignis* (O. P. Cambridge) (approximately $\times \frac{1}{2}$). B, Horizontal section through burrow of a specimen from Juranda (*Missulena incertae sedis*), at level of the side-shaft (slightly enlarged).

its surface. These doors were so thick that when not closing the side-shaft, they would have occluded the main burrow, were it not for a special cavity in the wall wherein the door swung when in an open position. The plan of this peculiar structure is shown diagrammatically in Figure 3B. Identification of this spider is still uncertain.

The localities of female specimens of *insignis* with the typical burrow structure as described above for this species are listed below. Unless otherwise stated only one specimen has been collected from each locality.

Brookton (6 miles south); Goomalling; Mogumber; Walebing (2 miles south); Minnivale; Ebano Creek; Woolaga Creek (2 specimens); Dalwallinu (6 miles north); Gutha; Canna; Mt. Gibson Station (4 miles west of homestead turnoff on Great Northern Highway, 2 specimens); Mt. Magnet (10 miles west); Mt. Magnet (30 miles east); Gullewa (4 miles north); Wurarga (5 miles east); Noongar (2 miles west, 2 specimens); Salmon Gums (6 miles south). Another specimen, identified as *insignis* was collected from Koolanooka Hills, but had a slightly aberrant burrow structure. In addition, Mr. V. N. Serventy obtained a specimen from Hyden, but without details of the burrow.

Habitat:

Missulena insignis is usually found in poor soils, often in coarse-grained granitic sandy clay. It sometimes occurs in situations which suffer mild flooding. It is almost always found in bare litterless ground. The species is generally associated with vegetation dominated by jam (*Acacia acuminata*) and *Casuarina* (often *acutivalvis*). Essentially, in Western Australia at least, the species seems to be an inland form, occurring in the broad sclerophyllous woodland zone of vegetation.

Life-history:

Mating in the genus *Missulena* apparently takes place during autumn through to mid-winter.

This is deduced from: the observation of Loaring and Loaring (1948) at Bickley of the mating preliminaries of specimens identified as *M. hoggi* on April 19, 1948: the author's observations of wandering males (one specimen also identified at the time as *M. hoggi*, 9 miles north of Bungulla, on June 5, 1955; *M. insignis* at Bruce Rock on June 3, 1955; *M. hoggi* at Chester Pass in the Stirling Ranges on June 11, 1954): and the fact that 21 specimens collected by friends of the author were all obtained while wandering, on dates between June 4 and August 13 over several seasons. Reports accompanying specimens received from associates indicate that males wander during daylight. The specimen collected by the author north of Bungulla was observed running about at 12.00 noon the sky was almost completely overcast and a cold east wind was blowing. Loaring and Loaring (*op. cit.*) reported a specimen wandering at "about 10.30 a.m."

An egg cocoon was collected from the side-shaft of a burrow of *Missulena* (species of uncertain identity) at Juranda on Decem-

ber 13, 1953. The cocoon contained 46 eggs which had an average diameter of 1.72 mm. The carapace length of the adult female was 3.40 mm.

Brood young have been observed in the burrows of two specimens. At least 50 spiderlings were present in the side-shaft of a burrow of *M. insignis* on April 9, 1955, 4 miles west of Mt. Gibson Station on the Great Northern Highway. It is of interest that brood animals of *insignis* are a uniform dark brownish to black colour with no trace of red. On May 8, 1955, about 50 spiderlings were observed running actively about the burrow of a *Missulena* (*species incertae sedis*) at the 46-mile peg on the Great Northern Highway (near Chittering Lakes).

Feeding biology:

The capture of prey by *Missulena* has not been observed by the author. One specimen of *M. insignis*, upon excavation, was found to have just captured a chafer beetle. The remains of prey, i.e. the sclerotised parts of invertebrates, are deposited in the burrows at the bottom and on the walls for several inches upward and also around the door of the side-shaft in the main chamber. It is possible roughly to identify much of this material. The contents of 12 burrows of *M. insignis* have been identified and the results are presented in Table 1. From this analysis it appears that at least this species of *Missulena* feeds predominantly on ants and beetles but will probably also eat any manageable invertebrate that passes within reach of the burrow.

TABLE 1

Fragments of prey identified from food debris collected from 12 burrows of *M. insignis* (O. P. Cambridge). In addition to the identifiable material the burrows contained a great amount of unrecognisable fragments.

ANTS	BETLES	MISCELLANEOUS
Campanotus, 5 mandibles, 1 head capsule. Campanotus (?) large, 12 mandibles. Iridomyrmex, 4 man- dibles. Myrmecia, 1 mandible, 1 head capsule. Numerous pieces of gasters.	Cureullionidae, 3 thoracic rings, 3 heads, 1 elytra.	
Campanotus, 2 mandibles, 1 head capsule. Rhyditoponera, 1 head capsule. Numerous frag- ments.	Beetle mandible (?)	
Campanotus, 1 head cap- sule, 2 mandibles. Rhyditoponera, 1 head capsule. Numerous pieces of gasters.		Mollusca, Bothryom- bryon melo, 5 shells (shells partly frag- mented but nepionic whorls intact).

1 head capsule.	Carabidae, Scaratine, head, thorax and elytra of 1 specimen. Curculionidae, Leptops, 5 entire elytrae, 11 half pieces of elytra. Unidentified Curculionids (3 or 4 species ?), 5 entire elytrae, 5 half pieces of elytra, 16 thoracic rings, 10 head capsules and numerous legs and other fragments.	Mollusca, Bothryembryon melo, 3 shells.
Campanotus, 1 mandible. Iridomyrmex, 2 head capsules. Rhyditoponera, 1 head capsule, 2 thoraxes and numerous gaster fragments.	Carabidae, 3 fragments of elytra. Curculionidae, 1 complete abdomen, 3 thoracic rings, 1 clytra, 2 heads. Tenebrionidae, Helaeus, fragments of elytra.	Mollusca, Bothryembryon melo, 1 shell. Fragment of fly maggot?
Rhyditoponera, 1 mandible, 4 head capsules. Campanotus, 3 head capsules, 2 mandibles. Gaster fragments.	Curculionidae, 1 head. Beetle fragments.	Spider chelicerae.
Rhyditoponera, 19 head capsules, 18 thoraxes. Gaster fragments.	Curculionidae, 1 clytra, 1 thoracic ring.	
1 head capsule.	Beetle fragments.	Cockroach (?) fragments.
Campanotus, 5 mandibles, 3 head capsules. Iridomyrmex, 1 head capsule. Rhyditoponera, 2 head capsules. Thoraxes.	2 elytrae	Crustacea, Armadillidium, 1 head.
11 head capsules (Campanotus and Iridomyrmex), 1 thorax and numerous gaster fragments.	Cleindelidae, head, thorax and elytra of 1 specimen. Curculionidae, 2 entire elytrae, 4 clytrae fragments, 3 heads, 1 thoracic ring, 1 entire and 6 fragmentary clytrae and 3 mandibles of beetles.	
Campanotus, 2 head capsules, 1 mandible.	Curculionidae, 1 clytra.	Isoptera, Drepanotermes rubriceps, 1 soldier mandible.
	Scarabidae, spider feeding on chafer at bottom of burrow. Curculionidae, clytra fragments.	

DISCUSSION

It is of interest that within the Mygalomorphae both *Missulena* (a member of the Ctenizidae, sub-family Actinopodinae), and representatives of the family Barychelidae have, apparently convergently, developed a double-doored burrow entrance. Feio (1952) gives a description and photographs of the entrance doors of *Paracenobiopelma gericormophila*, an arboreal Barychelid from Brazil. Some other Barychelid genera are reported to have 2 doors to the burrow. Also the author has collected terrestrial Barychelids with 2 doors from Western Australian localities. The Barychelid doors have the hinges parallel and in juxtaposition to one another, thus they open in exactly opposite directions, whereas the *Missulena* burrows have the doors facing in roughly the same direction and if the hinge lines of the doors are projected horizontally they intersect at an angle of about 120° (see Figures 1 and 2).

ACKNOWLEDGMENTS

Specimens which form the basis of the present study were collected and the reported observations made while in receipt of a University of Western Australia Research Grant. The author wishes to thank Mr. V. N. Serventy for the photographs of the *Missulena* burrow.

LITERATURE CITED

- Feio, J. L. A., 1952. Uma Curiosa Migalomorfa arboricola — "*Paracenobiopelma gericormophila*" g. n., sp. n. (Araneae, Barychelidae). *Bol. do Mus. Nac. (Rio de Janeiro)*, Zool. No. 113, 1-23.
- Loaring, W. H. and Loaring, Marie, 1948. An incident in the life of a trap-door spider. *West. Austr. Nat.* 1, 132.
- McKeown, K. C., 1952. "Australian Spiders". pp. 274 Angus and Robertson, Sydney.
- Rainbow, W. J. and Pulleine, R. H., 1918. Australian Trap-door spiders. *Rec. Austr. Mus.* 12, 81-169.
- Womersley, H., 1943. A revision of the spiders of the genus *Missulena* Walckenaer 1805. *Rec. S. Austr. Mus.* 7, 249-69.

SENTINEL DUTIES AMONG COCKATOOS

by RICA ERICKSON, "Fairlea," Bolgart.

In her book "Studies in the Life History of the Song Sparrow" on pp. 88-9, Margaret Morse Nice mentions the posting of sentinels by social birds and mammals. She then adds that it is hard to imagine by what technique a flock could post sentinels.

The following notes may shed some light on the matter.

My father used to tell of flocks of White Cockatoos feeding on planted grain in the paddocks of his boyhood home near Shepparton in Victoria. He said that the sentinel would change duties by flying down to a feeding bird and pecking it. The latter